CLAIMS

1. A polyisocyanate composition with a high mean functionality, obtained by polycondensation of diisocyanate or triisocyanate monomers, comprising:

(a) from 0.5% to 30% by mass, relative to the total mass of the components a), b) and c), of compounds bearing a single uretidinedione functional group having a molecular mass of not more than twice the average molecular mass of the isocyanate monomers having the highest molecular mass;

(b) from 0.5% to 45% by mass, relative to the total mass of the components a), b) and c), of compounds bearing a single isocyanurate functional group with a molecular mass of not more than three times the average molecular mass of said isocyanate monomers having the highest molecular mass;

the molar ratio of (a)/(b) being between 0.02 and 2, advantageously between 0.2 and 1.8, and preferably less than or equal to 1.6,

(c) at least 40% by mass, relative to the total mass of the components a), b) and c), of a mixture of polyisocyanate compounds having a molecular mass at least equal to three times the average molecular mass of the isocyanate monomers having the smallest molecular mass and bearing at least two isocyanate functional groups, and

said mixture comprising

(i) compounds bearing at least two isocyanurate functional groups, excluding those comprising uretidinedione functions,

(ii) compounds bearing at least two uretidinedione functional groups, excluding those comprising isocyanurate functions and for which the number of monomer units is less than 5,

(iii) compounds bearing at least one isocyanurate functional group and at least one uretidinedione functional group, having a molecular mass greater than three times the highest molecular mass of the above isocyanate monomer compounds;

said mixture having a ratio: carbonyl functional groups belonging to a uretidinedione ring/carbonyl functional groups belonging to an isocyanurate ring + carbonyl functional groups belonging to a uretidinedione ring, at least equal to 4%;

d) from 0 to 25% by mass, relative to the mass of the components a), b), c), d) and e), of compounds bearing at least one isocyanate functional group that are different than a), b) and c); and

e) from 0 to 10% by mass, relative to the mass of the components a), b), c), d) and e), of impurities.

2. The polyisocyanate composition as claimed in claim 1, characterized in that it has a functionality of greater than 3, advantageously greater than 3.5 and preferably greater than 4.

3. The polyisocyanate composition as claimed in claim 1, characterized in that it comprises from 1% to 30% by mass of the component (a) relative to the total mass of the components a) + b) + c).

4. The polyisocyanate composition as claimed in claim 1, characterized in that it comprises from 5% to 40% by mass of the component (b) relative to the total mass of the components a) + b) + c).

5. The polyisocyanate composition as claimed in claim 1, characterized in that the component c) represents at least 45% and advantageously at least 50% by mass relative to the total mass of the components a) + b) + c).

6. The polyisocyanate composition as claimed in claim 1, characterized in that the mass ratio [c)(i) + c)(iii)]/b) is greater than 2, advantageously greater than 3 and preferably greater than 4.

7. The polyisocyanate composition as claimed in claim 1, characterized in that the amount of compounds c)(ii) is less than 30% by weight relative to the total amount of compounds categorized in c), preferably less than 20% and more preferably less than 15%.

8. The polyisocyanate composition as claimed in claim 1, characterized in that the component d) represents not more than 10% by mass relative to the total mass of the components a) + b) + c) + d) + e).

9. The polyisocyanate composition as claimed in claim 1, characterized in that the component e) represents from 0.05% to 10%, generally from 0.1% to 8%, especially not more than 5% by mass relative to the total mass of the components a) + b) + c) + d) + e).

10. The polyisocyanate composition as claimed in claim 1, characterized in that the component e) consists of residues formed from

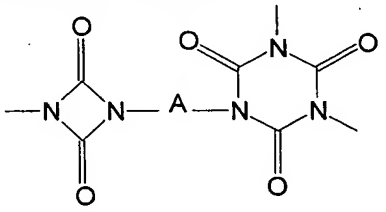
polycondensation catalyst and/or of byproducts from the polycondensation of the starting isocyanate monomers and/or of solvent(s).

11. The polyisocyanate composition as claimed in claim 1, characterized in that the component d) comprises said residual isocyanate monomer(s).

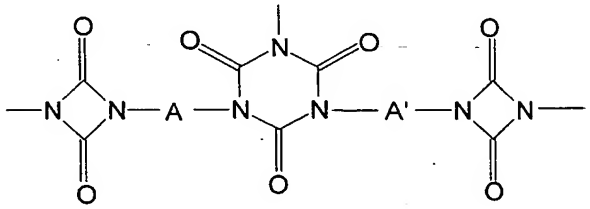
12. The polyisocyanate composition as claimed in claim 11, characterized in that said isocyanate monomer(s) represent(s) from 0.05% to 20%, more generally from 0.1% to 10%, advantageously not more than 2% and preferably not more than 1% by mass of the mass of the components a) + b) + c) + d) + e).

13. The composition as claimed in any one of the preceding claims, characterized in that it also comprises an amount of not more than 200% and advantageously not more than 100% by mass of a) + b) + c) + d) + e), preferably not more than 50%, an organic solvent or mixture of organic solvents that is liquid at ambient temperature, which does not comprise an isocyanate functional group, which does not comprise a functional group capable of reacting with the isocyanate functional group, which has a boiling point of not more than 200°C and which is miscible with the components a), b), c), d) and e).

14. The composition as claimed in any one of claims 1 to 13, characterized in that the compounds comprising at least one uretidinedione ring and at least one isocyanurate ring comprise a group chosen from formulae (I) to (V) below, and mixtures thereof:



(I)



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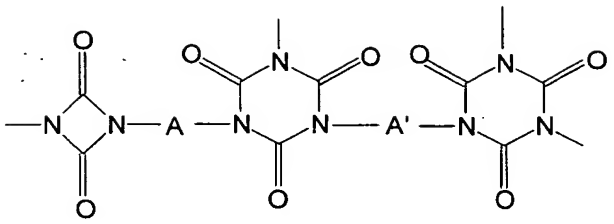
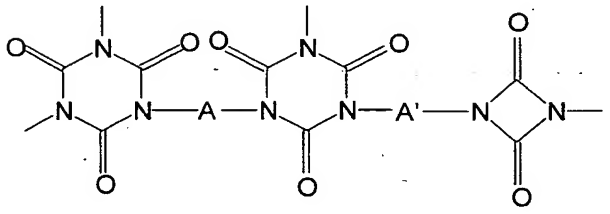
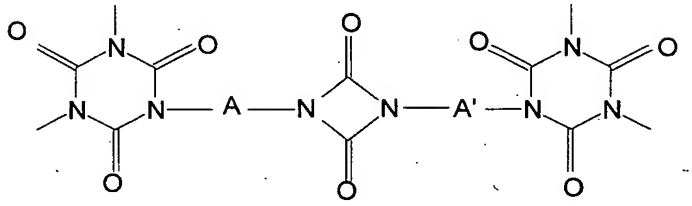


(III)



(IV)



(V)

in which A and A', which may be identical or different, represent the residues of an isocyanate monomer compound after removal of two isocyanate functional groups.

15. The composition as claimed in any one of the preceding claims, characterized in that it comprises from 1% to 100%, advantageously from 10% to 100%, of the NCO groups present in the composition masked using a masking agent.

16. The composition as claimed in claim 15, characterized in that the masking agent is a monofunctional masking agent chosen from hydroxylamine derivatives, oximes, phenol derivatives, amide derivatives, malonates, keto esters, hydroxamates and nitrogenous heterocyclic compounds.

17. The composition as claimed in claim 16, characterized in that the masking agent is methyl ethyl ketoxime or methyl pyruvate oxime.

18. The composition as claimed in claim 15, characterized in that the masking agent is chosen from pyrrolyl, 2H-pyrrolyl, imidazolyl, pyrimidinyl, pyridazinyl, pyrazinyl, pyrimidinyl, pyridazinyl, indolizinyl, isoindolyl, indolyl, indolyl,

indozolyl, purinyl, quinolizinyl, isoquinolyl, pyrazolidinyl, imidazolidinyl and triazolyl groups.

19. A process for preparing the polyisocyanate composition as claimed in one of claims 1 to 18, comprising the following steps:

i) a starting reaction medium is prepared comprising the starting isocyanate monomer(s) and optionally other monomers that react with the isocyanate functional group;

ii) the starting reaction medium is reacted in the presence of a dimerization catalyst, optionally by heating the reaction medium to a temperature of at least 40°C;

iii) the reaction product from step ii), comprising unreacted monomers, is reacted with a (cyclo)trimerization catalyst under (cyclo)trimerization conditions;

iv) the unreacted starting monomers are removed from the reaction product from step iii);

v) the reaction medium is optionally reacted with a masking agent before, during or after steps i) to iv);

in which process step iii) is carried out until a degree of conversion of isocyanate monomers present in the starting reaction medium of at least 35%, advantageously of at least 40% is achieved.

20. A process for preparing the polyisocyanate composition as claimed in any one of claims 1 to 19, comprising the following steps:

i) a starting reaction medium is prepared comprising the starting isocyanate monomer(s) and optionally other monomers that react with the isocyanate functional group;

ii) the starting monomers are reacted with a (cyclo)trimerization catalyst under (cyclo)trimerization conditions;

iii) the reaction medium of step ii) is reacted in the presence of a dimerization catalyst, optionally by heating the reaction medium to a temperature of at least 40°C;

iv) the unreacted starting monomers are removed from the reaction product from step iii);

v) the reaction medium is optionally reacted with a masking agent before, during or after steps i) to iv);

in which process step iii) is carried out until a degree of conversion of isocyanate monomers present in the starting reaction medium of at least 35%, advantageously of at least 40% is achieved.

21. The process as claimed in either of claims 19 and 20, characterized in that the dimerization catalyst is chosen from compounds such as tris(N,N-dialkyl)phosphotriamides, N,N-dialkylaminopyridines or trialkylphosphines.

22. The process as claimed in any one of claims 19 to 21, characterized in that the dimerization catalyst is chosen from compounds of trialkylphosphine type.

23. The process as claimed in any one of claims 19 to 22, characterized in that the trimerization catalyst is chosen from compounds of trialkylphosphine type.

24. The composition as claimed in any one of claims 1 to 18, for preparing a coating, characterized in that it also comprises, for successive or simultaneous addition, a coreactant comprising reactive hydrogen.

25. The use of the compositions as claimed in any one of claims 1 to 18, for preparing a coating, in particular a paint.

26. A process for preparing polymers, characterized in that it comprises the following steps:

- bringing the polyisocyanate composition as defined in any one of claims 1 to 18 into contact with a coreactant that comprises derivatives containing reactive hydrogens; and
- heating the reaction medium thus formed to a temperature that allows crosslinking of the components.